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Tamer Kadous

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EXAMINER

OVEISSI, DAVID M

ART UNIT

PAPER NUMBER

2464

NOTIFICATION DATE

DELIVERY MODE

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/801,624	Applicant(s) KADOUS, TAMER	
	Examiner DAVID OVEISSI	Art Unit 2464	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 October 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-19,21-24,26-29 and 31-49 is/are pending in the application.
- 4a) Of the above claim(s) 2, 20, 25, 30, and 40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-19,21-24,26-29,31-39 and 41-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claims 2, 20, 25, 30, and 40 have been cancelled.

Response to Arguments

1. Applicant's arguments with respect to claims 1, 3-19, 21-24, 26-29, 31-38 and 41-49 have been considered but are moot in view of the new grounds of rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 3-19, 21-29, 39, and 42-45 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims 1, 3-19, 21-29, 39, and 42-45 contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The amended claims 1, 3-19, 21-29, 39, and 42-45 recite limitation "each symbol block including different coded information" which is not described in the original

specification therefore it is considered new matter. Applicants assert that support for the recited limitation is paragraph [00 46} of the specification.

[0046] Referring back to FIG. 4A, a partitioning unit 416 receives and partitions the coded packet into NB coded subpackets, where N8 may be dependent on the selected rate and indicated by a partitioning control from controller 140. The first coded subpacket typically contains all of the systematic bits and zero or more parity bits. This allows the receiver to recover the data packet with just the first coded subpacket under favorable channel conditions. The other $N_s - 1$ coded subpackets contain the remaining first and second parity bits. Each of these $N_s - 1$ coded subpackets typically contains some first parity bits and some second parity bits, with the parity bits being taken across the entire data packet. For example, if $N_s = 8$ and the remaining first and second parity bits are given indices starting with 0, then the second coded subpacket may contain bits 0, 7, 14,... of the remaining first and second parity bits, the third coded subpacket may contain bits 1, 8, 15 of the remaining first and second parity bits, and so on, and the eighth and last coded subpacket may contain bits 6, 13, 20of the remaining first and second parity bits. Improved decoding performance may be achieved by spreading the parity bits across the other $N_s - 1$ coded subpackets. Nowhere in this paragraph mentions "each symbol block including different coded information.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 3-7, 9-19, 21-24, 26-29, and 31-49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

For claims 1, 7, 10, 13, and 41 the phrase "selected rate" is vague and infinite. Applicant's paragraph 6 defines "rate" as data rate, or information bit rate, a particular coding scheme, a particular modulation scheme, a particular data packet size, and so on. It is not clear from the limitation which of the above rate (data rate, encoding rate (coding rate and data transmission rate are not the same) or modulation scheme (modulation scheme and rate are not the same)) is chosen. Clearly selected rate cannot be equated to selected modulation scheme, selected coding rate, and selected data rate.

For claims 1, 3-7, 9, and 39-40 are rejected because of their dependency from claim1.

For claim 5 the recited limitation "receiving a negative acknowledgment (NAK) for the data packet from receiver " is vague and indefinite. It is also not clear which element receives the NAK message.

For claim 9 recites the limitation " wherein N_p data packet". There is insufficient antecedent basis for this limitation in the claim.

For claims 11-12 are rejected because of their dependency from claim 10.

For claim 14 is rejected because of their dependency from claim 13.

For claim 21 the limitations “obtaining a block of received symbols for the data symbol block” and “detecting the received symbol block to obtain the detected symbol block are vague and indefinite.

For claim 22 the recited “selecting a rate” is vague and indefinite. Applicant’s paragraph 6 defines “rate” as data rate, or information bit rate, a particular coding scheme, a particular modulation scheme, a particular data packet size, and so on. It is not clear from the limitation which of the above is chosen. In addition, examiner disagrees with the above generalization for example the packet size is measured in bits whereas data rate is measured in bit per second.

For claim 27 the recited limitation “a detector operative to obtain a block of received symbols for the data symbol block and to detect the received symbol block to obtain the detected symbol”. It is not clear what type detector is used and what is being detected.

For claim 28 the recited limitation “final iteration” is vague and indefinite. It is not clear what the final iteration is. Range of iterations must be specified otherwise it creates an infinite loop.

For claims 29, 31, 32, and 45 are rejected because of their dependency from claim 28.

For claim 32 the number of iteration N greater or equal to 1 makes vague and indefinite. N being greater than 1 creates infinite number of possibilities-N being greater one can be 2 or infinity.

For claim 33 the recited limitation "a final iteration" is vague and indefinite. It is not clear what the final iteration is. It is also not clear, what is being repeated or iterated.

For claims 34 and 46 are rejected because of their dependency from claim 33.

For claim 35 the recited limitation "a final iteration" is vague and indefinite. It is not clear what the final iteration is. It is also not clear, what is being repeated or iterated.

For claims 36 and 47 are rejected because of their dependency from claim 33.

For claim 37 the recited limitation "a final iteration" is vague and indefinite. It is not clear what type the last iteration is.

For claim 37 the recited limitation "N iteration where N is one or greater" is vague and indefinite. N being greater than one is indefinite loop.

For claims 38 and 48 are rejected because of their dependency from claim 37.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, 5-14, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Piirainen** in view of Applicant Admitted Prior Art (**AAPA**) further in view of **Lakkis (US 7,031,371 B1)**.

For claims 1, 10, 13, and 41 **Piirainen** with exception of each symbol block including different coded information limitation for the data packet teaches a method/transmitter/apparatus/processor readable medium of performing incremental redundancy (IR) (see column 7 line 46 “Incremental redundancy”) transmission in a wireless multiple-input multiple-output (MIMO) communication system(see column 2 line 6 “MIMO”), comprising:

obtaining a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver;

processing a data packet in accordance with the selected rate to obtain a plurality of symbol blocks, each symbol block including different coded information for the data packet (see abstract “symbol blocks” and column 9 lines 61-63 “selection can be made according to the known principles of space-time block coding”);

transmitting a first symbol block from a-the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks (see abstract “symbols are divided into blocks and transmitted from transceivers to transceivers”); and

transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted (see abstract “symbols are divided into blocks (plurality of blocks) and transmitted from transceivers to transceivers and checking whether the blocks were received successfully and combining blocks”).

Piirainen does not expressly teach obtaining a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver limitation.

However, **AAPA** teaches this limitation (see paragraph 6 “a rate may indicate data rate, coding scheme, modulation scheme, packet size, and so on”).

Thus, it would have been obvious to the person of ordinary skill in the art at time of invention to use the **AAPA** prior art teaching in the data transmission and reception system of **Piirainen**.

This combination is possible because both **Piirainen** and **AAPA** deal with the same problem of retransmission of symbol block when the received block is in error.

Piirainen/AAPA does not teach each symbol block including different coded information for the data packet limitation.

However, **Lakkis** this limitation (see column 1 line 40 “different code is assigned”, column 7 lines 24-25 “different code chips applied to different symbols”, and column 8 lines 64-67 “ variety of different codes”).

Thus, it would have been obvious to the person of ordinary skill in the art at the time of invention to combine the teachings of **Lakkis**, AAPA, with teachings **Piirainen** to arrive at the claimed invention.

The motivation for this combination is to improve the throughput of MIMO system.

For claims 3, 11-12, and 14 **Piirainen** teaches a method/transmitter/apparatus, wherein the processing includes

encoding the data packet in accordance with a coding scheme indicated by the selected rate to obtain a coded packet (see abstract column 9 lines 61-63 “selection is made based on STBC”, Fig. 4 “packet coding; division into bursts, and division of burst into groups”),

partitioning the coded packet into a plurality of coded subpackets (see abstract column 9 lines 61-63 “selection is made based on STBC”, Fig. 4 “packet coding; division into bursts, and division of burst into groups”), and

modulating the plurality of coded subpackets in accordance with a modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks (see column 1 lines 28-29 “data rate and modulation” and column 4 line 18 “CDMA and FDMA”).

For claim 5 **Piirainen** teaches a method, further comprising:

receiving a negative acknowledgment (NAK) (see Fig. 4 “NACK”) for the packet from the receiver; and

transmitting a next symbol block among the remaining ones of the plurality of symbol blocks in response to receiving the NAK (see Fig. 4 “NACK”).

For claim 6 **Piirainen** teaches a method, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of the plurality of symbol blocks is transmitted from a plurality of subbands of the plurality of transmit antennas, if the symbol block is selected for transmission (see Fig. 3 “MIMO data transmission” and column 4 line 18-19 “OFDM”).

For claim 7 **Piirainen** teaches a method, wherein at least two data packets are each processed in accordance with the selected rate to obtain at least two pluralities of symbol blocks, one plurality of symbol blocks for each data packet, and wherein at least two symbol blocks for the at least two data packets are transmitted simultaneously from the plurality of transmit antennas to the plurality of receive antennas (see abstract “dividing symbols to be transmitted into blocks and transmitting blocks using each antenna and the division is based on the number of antennas” and column 9 line 32 “simultaneously transmission”).

For claim 8 **Piirainen** teaches a method of performing incremental redundancy

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(IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system (see Fig. 3 “MIMO transmission”), comprising:

processing a data packet to obtain a plurality of symbol blocks, each symbol block including different coded information for the data packet (see abstract “plurality of symbol blocks have been obtained and processed”);

transmitting a first symbol block from a plurality of transmit antennas at a transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks (see abstract “transceiver, symbol blocks and antennas”); and

transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of at least two symbol blocks for at least two data packets is transmitted diagonally across a plurality of subbands and the plurality of transmit antennas (see Fig. 3 “MIMO data transmission illustration”, column 4 line 19 “OFDM” and column 7 lines 5-6 “diagonal transmission”).

For claim 9 **Piirainen** teaches a method, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), wherein N_p data packets are each processed in accordance with the selected rate to obtain N_p pluralities of symbol blocks, one plurality of symbol blocks for each data packet, where N_p is equal to or greater than one and is selected based on a rank of the MIMO channel, and wherein N_p symbol

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blocks for the N_p data packets are transmitted simultaneously diagonally across a plurality of subbands and the plurality of transmit antennas (see Fig. 3 “MIMO data transmission illustration”, column 4 line 19 “OFDM”, and column 6 lines 55-60 “formula 1”).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Piirainen** in view of Applicant Admitted Prior Art (**AAPA**) further in view of **Tarokh** et al. (US 2004/0057530 A1).

For claim 4 **Piirainen** does not teach a method, wherein the coding scheme is a Turbo code, and wherein the first symbol block includes systematic bits for the data packets. However, **Tarokh** teaches this limitation (see paragraph 52 “Turbo code”). Thus, it would have been obvious to a coding scheme such as Turbo code taught by **Tarokh** in the encoder of **Piirainen**. This combination is possible because **Piirainen** uses the encoder of **Tarokh** (see column 9 line 63 **Tarokh**).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 15-19, 22-24, 26-29, 31-40, and 49 are rejected under 35 U.S.C. 103 (a) as being unpatentable over **Tarokh (US 2004/0057530 A1)** in view of **Lakkis (US 7,031,371 B1)**.

For claims 15, 23, 26, and 49 **Tarokh** with exception of each symbol block including different coded information for the data packet teaches a method/receiver/apparatus/processor-readable medium of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system (see abstract “IR” and paragraph 8 “MIMO”), comprising:

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet, each symbol block including different coded information for the data packet (see abstract “a transmitter sends packets via blocks of symbol to the receive”, Fig. 5 “channel estimation, STC Decoder, Channel decoder, and Error detection”, paragraph 9 “detection algorithm”, paragraph 74 “detect decoded errors”, and paragraph 8 “antennas”);

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet (see abstract “decoding symbols”);

determining whether the decoded packet is correct or in error (see abstract “decoding of incorrectly received packets”); and

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error (see the abstract “ a hybrid ARQ feedback mechanism being used to repeat the obtaining, decoding, and error detection” and paragraph 24 “automatic repeat”),

Tarokh does not teach each symbol block including different coded information for the data packet.

However, **Lakkis** this limitation (see column 1 line 40 “different code is assigned”, column 7 lines 24-25 “different code chips applied to different symbols”, and column 8 lines 64-67 “ variety of different codes”).

Thus, it would have been obvious to the person of ordinary skill in the art at the time of invention to combine the teachings of **Lakkis** with teachings **Piirainen** to arrive at the claimed invention.

The motivation for this combination is to improve the throughput of MIMO system.

For claims 16, 24, and 27 **Tarokh** teaches a method/receiver/apparatus, further comprising: obtaining a block of received symbols for the data symbol block; and detecting the received symbol block to obtain the detected symbol block (see abstract “obtained blocks of symbols are sent via transmitter to receiver”, Fig. 5 CRC and ERROR DETECTION”, and paragraph 63 “incoming bits, packets, or symbol are monitored and in case error HARQ algorithm is performed”).

For claim 17 **Tarokh** teaches a method, wherein the detecting is based on a minimum mean square error (MMSE) detector, a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”).

For claim 18 **Tarokh** teaches a method, further comprising:
terminating the obtaining, decoding, and determining if the decoded packet is correct or if the plurality of data symbol blocks for the data packet have been transmitted (see paragraph 25 “feedback mechanism”).

For claim 19 **Tarokh** teaches a method, further comprising:
sending an acknowledgment (ACK) for the data symbol block if the decoded packet is correct or a negative acknowledgment (NAK) if the decoded packet is in error (see paragraph 24 “ACK & NAK”).

For claim 22 **Tarokh** teaches a method, further comprising:
deriving a signal-to-noise-and-interference ratio (SNR) estimate for each of the plurality of transmit antennas (see paragraph 59 “SNR and channel estimation function”),

computing an average SNR based on SNR estimates for the plurality of transmit antennas (see paragraph 59 “SNR with antenna” and paragraph 64 “SNR & CQI”),

determining a back-off factor (see paragraph 101 “delay diversity”), and
selecting a rate based on the average SNR and the back-off factor, for data
transmission on a MIMO channel between the plurality of transmit antennas and the
plurality of receive antennas (see paragraph 101 “delay diversity and data rate”).

For claims 28, 33, and 35 **Tarokh** teaches a method/receiver/apparatus of
receiving an incremental redundancy (IR) transmission in a wireless multiple-input
multiple-output (MIMO) communication system, comprising:

receiving a block of received symbols for a data packet, wherein the received
symbol block is for a data symbol block transmitted from a plurality of transmit antennas
at a transmitter and received by a plurality of receive antennas at a receiver, and
wherein the data symbol block is one of a plurality of data symbol blocks generated for
the data packet see abstract “obtained blocks of symbols are sent to the receiver”,
paragraph 60 “the symbols from incoming signal and channel estimates are provided to
the decoder”, and claim 21 f “STB is used to decode a first estimate for the original
symbols”);

detecting all received symbol blocks received for the data packet to obtain
detected symbol blocks, one detected symbol block for each received symbol block (see
abstract and paragraphs 25, 42, 77, and 78 “symbol blocks are decoded to recover
packets and determine whether there are errors to initiate HARQ”);

decoding the detected symbol blocks for the data packet to obtain decoder
feedback information (see abstract “at the receiver is determined whether the received

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symbol is in error or not that determination information is used as a feedback to the transmitter”);

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration (see abstract “hybrid ARQ feedback mechanism” paragraph 83 “iterative MMSE and MLD, can be used to improve the system performance”); and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iteration (see abstract “hybrid ARQ feedback mechanism” paragraph 83 “iterative MMSE and MLD, can be used to improve the system performance”).

For claims 29 and 36 **Tarokh** teaches a method/apparatus, further comprising:

determining whether the decoded packet is correct or in error (see abstract “error detection”, and

repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted (see abstract “multiple of symbol blocks being communicated between transmitter and receiver in case received error automatic request is initiated with feedback mechanism that can be repeated until the correct symbol, packet or bit are received ARQ, and error detection” .

For claim 31 **Tarokh** teaches a method, wherein the detecting is based on a minimum mean square error (MMSE) detector, a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”).

For claim 32 **Tarokh** teaches a method, wherein the MMSE detector is used for the detecting for N iterations and the MRC detector or the ZF detector is used for the detecting after N iterations, where N is one or greater “iterative MMSE and MLD, can be used to improve the system performance-N is definite”).

For claim 34 **Tarokh** teaches a receiver, further comprising:

a controller operative to, if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted, direct the buffer to receive and store another received symbol block for another one of the plurality of data symbol blocks, and to direct the detector and decoder to perform detection and decoding on all received symbol blocks received for the data packet to obtain the decoded packet (see paragraph 70 “received signals stored from the first transmission along the symbol received during retransmission” and paragraph 79 receiver store received symbols in case they are not properly decoded”).

For claim 37 **Tarokh** teaches a method of receiving a data transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

detecting received symbols for a data packet to obtain detected symbols (see abstract “decode the received blocks of symbols”);

decoding the detected symbols to obtain decoder feedback information (see abstract “at the receiver is determined whether the received symbol is in error or not that determination information is used as a feedback to the transmitter”);

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration, wherein the detecting is performed based on a minimum mean square error (MMSE) detector for first N iterations, where N is one or greater, and based on a maximal ratio combining (MRC) detector or a linear zero-forcing (ZF) detector for remaining ones of the plurality of iterations (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”, paragraph 83 “iterative MMSE and MLD”).; and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iteration (see paragraph 83 “iterative MMSE”)

For claim 38 **Tarokh** teaches a method, wherein N is equal to one (see abstract the feedback mechanism perform as a loop when there is an error it feeds back the information to the transmitter the number of iteration can be programmed the number of iteration is at least one if there is an error. However, the number repetition can be set to any value 1 or greater than 1.”).

For claim 39 **Tarokh** teaches a method, further comprising:

transmitting the data packet and at least one additional data packet in an interlaced manner, wherein symbol blocks for each data packet are transmitted in slots spaced apart by a predetermined number of slots (see abstract “additional symbols are sent” Fig. 4 “SYMBOL INTERLEAVE & BIT INTERLEAVE” , Fig. 5 “SYMBOL DE-INTERLEAVE & BIT DE-INTERLEAVE” and paragraph 85 “next available time slot”).

For claim 40 **Tarokh** teaches a method wherein the plurality of symbol blocks comprise different redundancy information for the data packet (see 23 “redundant parity symbols are transmitted, signal energy, or combination thereof are provided to the receiver, which can be used to correctly decode the transmitted data”).

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Tarokh et al. (US 2004/0057530 A1)** in view of **Alouini et al. (US 6,304,593 B1)** further in view of **Lakkis (US 7,031,371 B1)**.

For claim 21 **Tarokh** teaches a method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

Determining a rate for data transmission based on an average spectral efficiency for a plurality of transmit antennas at a transmitter;

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet based on the rate, each symbol block including different coded information for the data packet (see abstract “obtained blocks of symbols are sent to the receiver”, paragraph 60 “the symbols from incoming signal and channel estimates are provided to the decoder”, and claim 21 f “STB is used to decode a first estimate for the original symbols” and see claim 15);

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet (see abstract and paragraphs 25, 42, 77, and 78 “symbol blocks are decoded to recover packets and determine whether there are errors to initiate HARQ”) ;

determining whether the decoded packet is correct or in error (see abstract and paragraphs 25 and 42 “symbol blocks are decoded to recover packets and determine whether there are errors to initiate HARQ”);

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error (see paragraph 24 “automatic repeat request (ARQ)”); and

Tarokh does not teach determining a rate for data transmission based on an average spectral efficiency for the plurality of transmit antennas.

However, **Alouini** teach this limitation (see column 2 lines 3-10 “average spectral efficiency definition and its relation to the data rate and bandwidth”). Thus, it would have

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been obvious to the person of ordinary skill in the art at the time of invention to use the teaching of **Alouini** with teaching **Tarokh** to arrive derive a formula for rate calculation.

This combination is possible because **Tarokh** teaches bandwidth and data rate and various coding, modulation, and decoding techniques.

The motivation for this combination is to optimize the overall throughput of MIMO data communication.

8. Claims 42-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tarokh et al. (US 2004/0057530 A1)** in view of **Haustein et al. (US 7,366,520 B2)**.

For claim 42-48 **Tarokh** teaches a method/receiver/apparatus/, further comprising:

obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas (see paragraph 57 "pilot signals are used for channel estimation"; and

Tarokh does teach selecting, based on the channel estimates, a rate for data transmission on the MIMO channel. However, **Haustein** teaches this limitation (see claim 1 "estimation of the channel matrix is determined at a symbol rate in dependence at the channel properties whereby making use of the reciprocity of MIMO channel").

Thus, it would have been obvious to the person of ordinary skill in the art at the time of

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invention to use the information taught by **Haustein** to draw various rate from the MIMO channel estimation.

The motivation for this combination is to enhance the overall throughput of MIMO channel.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: **Thomas et al. (US 6,987,819 B2)** and **Agrawal et al. (US 6,873,606 B2)**.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID OVEISSI whose telephone number is (571)270-3127. The examiner can normally be reached on Monday to Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on (571) 272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ricky Ngo/
Supervisory Patent Examiner, Art
Unit 2464
